

deposited on both the polished bottom surface of the wafer and the unpolished upper surface of the wafer. The SiN_x layer overlying the unpolished upper surface of the wafer forms a sacrificial layer, and the SiN_x layer overlying the polished bottom surface of the wafer forms a mask layer. The SiN_x mask layer overlying the polished bottom surface of the wafer was then patterned with photoresist.

Patterning the SiN_x mask layer overlying the polished bottom surface of the wafer included spreading a photoresist layer over this SiN_x layer. Patterning steps also included at least exposing, developing, and baking the photoresist. Such baking step occurred at a temperature of about 120°C for about 20 minutes to hard-bake the photoresist layer. The patterning steps formed a plurality of squares (or rectangles). After patterning, exposed regions were etched forming trapezoidal shaped blocks attached to the SiN_x sacrificial layer.

In fabricating smaller trapezoidal shaped blocks for the second silicon experiment, a SOI wafer provided a substrate for the formation of self-aligning shaped blocks. The particular SOI wafer used had a SOI layer of about $35\text{ }\mu\text{m}$ thickness with a silicon dioxide (SiO_2) layer of about $0.4\text{ }\mu\text{m}$ thickness separating it from the rest of the wafer. The $35\text{ }\mu\text{m}$ SOI layer is the block layer of silicon from which the trapezoidal shaped blocks are formed. The SiO_2 layer of about $0.4\text{ }\mu\text{m}$ thickness is the sacrificial layer. A SiN_x mask layer of thickness about $0.4\text{ }\mu\text{m}$ was deposited on both $35\text{ }\mu\text{m}$ silicon block layer and patterned with photoresist.

Patterning the SiN_x mask layer overlying the upper surface of the wafer included spreading a photoresist layer over this SiN_x mask layer. Patterning steps also included at least exposing, developing, and baking the photoresist. The patterning steps formed a plurality of rectangles each having a dimension of about $150\text{ }\mu\text{m} \times 150\text{ }\mu\text{m}$ (exposed portions of the photoresist). After patterning, unexposed regions were etched forming trapezoidal shaped blocks attached to the SiO_2 sacrificial layer.

The slowest etching planes for silicon in this $\text{KOH:H}_2\text{O}$ etching solution are the $\{111\}$ planes, which can be considered etch stops forming the sloping sides of the shaped blocks. In each silicon experiment, the respective mask used to define the blocks must be aligned to the appropriate crystal axis. As shown in Fig. 100, a mask was used to form silicon trapezoidal shaped blocks. Trapezoidal shaped block is formed at the intersection of the diagonal lines on the mask. The width of the diagonal lines in the figure must be twice the thickness of the silicon block layer. For the larger trapezoidal blocks, $a = 0.2\text{ mm}$ and $t = 235\text{ }\mu\text{m}$; whereas, for the smaller trapezoidal blocks, $a = 0$ and $t = 35\text{ }\mu\text{m}$.

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